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PHYSICS.—*The density and thermal expansion of ethyl alcohol and its mixtures with water.* N. S. OSBORNE, E. C. MCKELVY and H. W. BEARCE. Communicated by L. A. Fischer. To appear in the Bulletin of the Bureau of Standards. 1912.

Part I. The preparation of pure ethyl alcohol. E. C. MCKELVY. Ethyl alcohols from different sources were subjected to purification treatments. The lower boiling impurities were completely removed by heating the alcohol for a considerable time under a reflux condenser, the water of which was held at about 60° C. Dehydration was accomplished by means of lime, aluminium amalgam, and metallic calcium, giving an alcohol of nearly identical physical properties. The first two gave equally good results. The density values obtained with metallic calcium were somewhat higher. The physical properties used as criteria of purity were the density and the critical solution temperature of alcohol-kerosene mixtures (Crismer). These two methods are of approximately equal sensitiveness. An alcohol was obtained which when subjected to an additional dehydration and fractionation gave alcohol of the same density and with no separation into fractions of different densities. Dehydration and subsequent fractionation under reduced pressure gave alcohol of essentially the same density. These results indicate that the alcohol was pure within the limits set by the accuracy of determination of the physical constants used as criteria of purity. Dissolved acetic aldehyde increased the density while ethyl ether and air decreased it.

The low results obtained for the density of anhydrous ethyl alcohol by Messrs. Squibb could not be obtained by a repetition of their procedure. A repetition of the procedure of Mendeléef gave results closely agreeing with his. Tables are given showing the comparison of results with those of former investigators. The mean density of fifteen of the fractions regarded as the purest was found to be 0.78506, at 25° C.

Part II The thermal expansion of mixtures of ethyl alcohol and water. N. S. OSBORNE. Twelve mixtures of alcohol and water were prepared and their densities at 10°, 15°, 20°, 25°, 30°, 35°, and 40° C. determined by the method of hydrostatic weighing. The observations of density for each mixture were reduced by the method of least squares and the coefficients of the assumed equation

$$D_t = D_{25} + \alpha\,(t-25) + \beta\,(t-25)^2 + \gamma\,(t-25)^3$$

determined. The values of D_{25}, α, β and γ for the twelve mixtures are shown in Table I.

TABLE I

PERCENT ALCOHOL BY WEIGHT	DENSITY AT 25°C.			
	g/ml	$\alpha \times 10^7$	$\beta \times 10^9$	$\gamma \times 10^{10}$
0.000*	0.997077	−2565	−484	+319
4.907	0.988317	−2684	−502	+311
9.984	0.980461	−3119	−484	+258
19.122	0.967648	−4526	−393	+180
22.918	0.962133	−5224	−331	+100
30.086	0.950529	−6431	−226	+ 47
39.988	0.931507	−7488	−145	− 4
49.961	0.909937	−8033	−128	− 24
59.976	0.887051	−8358	−121	− 24
70.012	0.863380	−8581	−117	− 9
80.036	0.839031	−8714	−108	− 69
90.037	0.813516	−8746	− 93	− 51
99.913	0.785337	−8593	− 57	− 62

* Water according to Chappuis.

The values of α, β and γ for each integral per cent of alcohol between 0 and 100 were then obtained by interpolation.

Part III. The density of ethyl alcohol and its mixtures with water. N. S. OSBORNE. The mean of fifteen determinations of the density at 25° C. of the purest alcohol obtained was found to be 0.78506 gram per milliliter. A series of twenty-five mixtures of known percentages of alcohol and water were prepared as close as possible to integral per cents and their densities at 25° C. determined, partly by the method of hydrostatic weighing and partly by the use of special picnometers; the same constant temperature bath being used in both methods. The densities of the various mixtures, reduced to the nearest integral per cent, are shown in Table II. The values for 90 and 95 per cent are each the mean results of two mixtures.

TABLE II

PERCENT ALCOHOL BY WEIGHT	DENSITY (*) AT 25°C. *g/ml*	PERCENT ALCOHOL BY WEIGHT	DENSITY AT 25°C.
0	0.997077	55	0.898502
2	0.993359	60	0.886990
5	0.988166	65	0.875269
6	0.986563	70	0.863399
10	0.980434	75	0.851336
15	0.973345	80	0.839114
20	0.966392	85	0.826596
25	0.958946	90	0.813622
30	0.950672	95	0.799912
35	0.941459	98	0.791170
40	0.931483	99	0.788135
45	0.920850	100	0.785058
50	0.909852		

* These density values are for mixtures saturated with air.

Tables I and II permit the calculation of the density of any mixture of ethyl alcohol and water at any temperature between 10° and 40° C. (Circular No. 19, Bureau of Standards).

Part IV. The density and thermal expansion of ethyl alcohol and its mixtures with water. H. W. BEARCE. A second and independent series of mixtures of known percentages of alcohol and water were prepared and their densities determined at 15° and 25° C., thus furnishing, at the same time, a check on both the

density at 25° and the change of density between 15° and 25°, as determined in Parts II and III. A comparison of the two series is given in Table III. The results obtained in Parts II and III are shown in the columns headed Osborne, those from Part IV in the columns headed Bearce.

TABLE III

PERCENT ALCOHOL BY WEIGHT	DENSITY AT 15°C. *g/ml*		DENSITY AT 25°C. *g/ml*	
	Osborne	Bearce	Osborne	Bearce
0	0.99913	0.99913	0.99708	0.99708
10	0.98304	0.98305	0.98043	0.98044
20	0.97069	0.97070	0.96639	0.96640
30	0.95686	0.95688	0.95067	0.95067
40	0.93883	0.93882	0.93148	0.93146
50	0.91776	0.91777	0.90985	0.90985
60	0.89523	0.89524	0.88699	0.88698
70	0.87187	0.87186	0.86340	0.86340
80	0.84772	0.84773	0.83911	0.83910
90	0.82228	0.82228	0.81362	0.81360
100	0.79360	0.79360	0.78506	0.78505

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

METEOROLOGY.—*The earth's radiation zones.* W. J. HUMPHREYS. Bulletin of the Mount Weather Observatory, **4**: 129–135. 1911.

If, as it is now generally believed, the temperature of the atmosphere above the level of vertical convection is determined by radiation from lower levels, then it follows that the greater this radiation the greater also will be the resulting temperature of the upper atmosphere.

Also, since water vapor has a high coefficient of absorption for long wave lengths, the lower atmosphere of any place may, without materially affecting the temperature of the corresponding isothermal region, be replaced by an equivalently radiating black surface. From this it can be shown that the absolute temperatures of these equivalently radiating black surfaces at different parts of the world would be to each other approximately as the absolute temperatures of the isothermal region in the corresponding places.

Hence, to the same degree of approximation, the intensity of the outgoing radiation at one place is to that at another as the fourth powers of the corresponding absolute temperatures of the isothermal region.

The curious conclusion this leads to is, that the intensity of the earth's outgoing radiation is much greater in middle latitudes, than it is in equatorial regions, as shown in the accompanying table.

EARTH RADIATION (GRAM CALORIES PER SQUARE CENTIMETER PER MINUTE) AT DIFFERENT LATITUDES

0°–10°	10°–20°	20°–30°	30°–65°	65°–70°	70°–90°
0.26	0.27	0.31	0.34	0.31	0.27

W. J. H.

GEOLOGY.—*Economic geology of Richmond, Virginia, and vicinity.* N. H. DARTON. Bulletin U. S. Geological Survey No. 483. Pp. 48, with maps, sections, and views. 1910.

The Richmond region belongs in part to the Piedmont province, in part to the Coastal Plain. Granite of undetermined age constitutes the oldest rock of the area, and is succeeded by sedimentary formations as follows: (1) Patuxent (Lower Cretaceous), Aquia, (Eocene), Calvert (Miocene), Lafayette (Pliocene?), and terrace alluvium (Columbia). All these formations except the Columbia dip gently to the east and are separated by unconformities. A. H. BROOKS.

GEOLOGY.—*Reconnaissance of the geology and mineral resources of Prince William Sound, Alaska.* U. S. GRANT and D. F. HIGGINS. Bulletin U. S. Geological Survey No. 443. Pp. 89, with maps, sections, and views. 1911.

Prince William Sound lies within highlands which form a part of the Chugach Mountains. The fairly accordant tops of these mountains, composed of highly folded strata, suggests an elevated peneplain which has been warped and highly eroded. In this erosion glaciation has played a prominent part. The topography of Prince William Sound is that of a maturely eroded mountainous district with the forms of river erosion modified by ice erosion. Into such a district the sea has come, filling the main basin of the sound and extending far up the valleys that lead into it. The evidence of glaciation are smoothed and striated rock surfaces, roches moutonnées, hanging valleys, U-shaped valleys, fiords, etc., with some deposits of till and glacial gravels.

The sedimentary rocks of the region are chiefly closely folded slates and graywackes, separable into two unconformable series, a lower, the Valdez group, and an upper, the Orca group. Locally a conglomerate formation occurs at the base of the Orca, with which is also associated a large amount of greenstone. These greenstones are altered basic lavas having in many places an ellipsoidal character. Intruded in these series are granites and acid and basic dikes.

The copper-bearing lodes occur along zones of fracture and mainly in the greenstones, but some are in slates and graywackes, and some in the contact between the sediments and the greenstones. Mineral deposition in the shear zones in part followed open spaces, in part impregnated the country rock. The deposits are not definitely known to be related to intrusives, but some basic dikes occur which may have had some mineralizing influence. A. H. BROOKS.

THERAPEUTICS.—*XV. Attempts at specific therapy in leprosy.* DONALD H. CURRIE, MOSES T. CLEGG,, and HARRY T. HOLLMANN, U. S. Public Health and Marine Hospital Service, Honolulu, T. H. Public Health Bulletin 47.

The authors, after fully reviewing an extensive literature, bearing on previous attempts at specific therapy in leprosy, describe several substances that they have prepared from their artificial cultures of B. leprae. These substances were given to several cases of leprosy for varying periods of time, and in some instances caused general and local reactions.

Up to the time this article was prepared, there was no evidence that any of these substances were of benefit to the patients receiving them, nevertheless, experiments of this nature are being continued in hopes that more success will be met with in future.

Among the substances employed was the serum of a horse, which animal had been partially immunized to live cultures of B. leprae. This animal's serum showed distinct evidence of containing agglutinins, it being able to clump B. leprae in dilutions of 1 to 1000.

DONALD H. CURRIE.

PHARMACOLOGY.—*Digest of comments on the Pharmacopoeia of the United States of America (eighth decennial revision) and the National Formulary (third edition) for the calendar year ending December 31, 1909.* MURRAY GALT MOTTER and MARTIN I. WILBERT, U. S. Public Health and Marine Hospital Service. Bulletin of the Hygienic Laboratory 79. 1911.

The present bulletin is the fifth of the series of "Digests of Comments" on the Pharmacopoeia of the United States and the National Formulary, now in course of revision. These books, as is well known are recognized by the Food and Drugs Act of June 30, 1906, as the standard authority with reference to the identity, purity and strength of the medicaments therein described and are, therefore, of direct interest and value as public health measures.

The available literature of the year 1909 containing matter of interest to the revisers of the Pharmacopoeia and the National Formulary has been carefully reviewed and practical suggestions and references, bearing on the improvement of the two books as standards under the law, are presented in as concise a form as possible.

As in previous Bulletins of this series, considerable space is devoted to the consideration of the possible development of international standards for potent medicaments, and the gradual compliance of foreign

Pharmacopoeias, with the provisions of the treaty signed at Brussels in 1906, is noted. The Pharmacopoeias published during 1909 and 1910 are reviewed and a summary of the compliances with the Protocol of the Brussels Conference as evidenced by the Pharmacopoeias published from 1905 to 1910 is presented in the form of a table.

Several additional tables presenting a comparison of the standards for various official articles are also included and will no doubt prove to be of value in connection with the present revision of the Pharmacopoeia of the United States.

In addition to their direct use as a ready reference to the comments on the articles included in the Pharmacopoeia and the National Formulary these Bulletins will also be found to be of value as a résumé of the current literature relating to widely used medicaments. M. G. M.
M. I. W.

BACTERIOLOGY.—*XVI. Complement deviation and agglutination in leprosy-immunity.* DONALD H. CURRIE and MOSES T. CLEGG, Public Health and Marine Hospital Service. Public Health Bulletin 50.

The authors report on complement deflection and on the presence of agglutinins in immune sera, as a means of differentiating acid-fast bacteria.

They used for their experiments acid-fast bacilli, cultivated from leprous lesions, as well as a number of acid-fast bacilli isolated from other sources. The authors found that similar extracts of both the lepra bacillus and the Margarine bacillus would deflect the complement when combined with certain lepers' serum, and further the serum of artificially immunized animals against B. leprae would deflect the complement when extracts of the Margarine bacillus was used as the antigen.

Physiological salt solution, extract of the acid-fast bacilli and extracts prepared with alkalinized hydrogen peroxide would bind the complement, whereas very small amount of alcohol extracts and alcohol chloroform extracts absorbed the complements.

The authors were able to produce specific agglutinins in a horse by repeated injections of increasing amounts of a suspension of the cultivated leprosy bacillus. This serum agglutinated in relatively high dilutions, all acid-fast bacilli cultivated by the writers from patients suffering with leprosy. On the other hand agglutination did not occur with suspension of acid-fast bacilli other than B. leprae.

DONALD H. CURRIE.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE BOTANICAL SOCIETY OF WASHINGTON

The seventy-seventh regular meeting was held at the Cosmos Club, Tuesday, January 9, 1911, at 8 p.m., with President W. A. Orton in the chair. Prof. E. O. Wooton and F. D. Farrell, both of the Bureau of Plant Industry were elected to membership.

Papers were read as follows:

Botanical gardens of the east. LYSTER H. DEWEY. A trip to Java to attend the International Fiber Congress and Exhibition held at Soerabaia in July, 1911, afforded an opportunity to visit several botanical gardens at points along the route. The gardens visited were as follows: Alameda Garden, Gibraltar; Jardin d'Essais and University Grounds, Algiers; Botanical Garden, Penang; Botanical Garden and Experimental Grounds, Singapore; Botanical Garden, Buitenzorg; Public Gardens, Hongkong; and Botanical Garden, Taihoku, Taiwan (Formosa).

The Alameda Garden is an attractive tho rather formal little public park in the upper part of the town of Gibraltar at the foot of the great rock. It is in about the same latitude as Raleigh, N. C., but the vegetation is more like that of southern Florida.

The Jardin d'Essais, at Algiers, extends from the sea shore back to about 200 feet up the hillside and covering an area of 80 hectares. It was founded in 1832, and is doubtless the oldest and certainly the most important garden of its kind in Africa. Its avenues of plane trees, date palms, magnolias, bamboos, chamaerops, latanias and dracaenas are especially worthy of note. Eucalyptus and Araucaria from Australia are growing well in the upper part of the garden. Many of the plants in the older part of the garden are crowded and labels are sadly lacking.

The University Grounds, mostly blasted out in terraces on the rocky hillside in Mustapha, the upper part of Algiers, is the special production and field of study and work of Dr. Trabut, for many years botanist at the University and botanical authority of northern Africa. This collection of thousands of plants crowded together and made to grow under difficult conditions, with the large number of hybrid agaves, eucalyptus, papayas, solanums, citrus, etc., bear evidence of the tireless energy and devotion to work of this botanical gardener of Algiers.

The twelve-hour stop at Colombo, Ceylon, was too short to visit the garden at Peridiniya.

At Penang, in the Straits of Malacca, is one of the most beautiful botanical gardens in all the world. Its Malay name, "Ayer terjun," is derived

from the waterfall coming over a cliff at the back of the garden. The exquisite beauty of this garden is due to the well kept green lawn, the grouping of many kinds of palms and especially to the splendid specimens of rajah palms, *Cyrtostachysl akka*, with brilliant scarlet midribs and graceful feathery leaves. There are many economic as well as ornamental plants in this garden and all are well labeled.

The large and well planted Botanical Garden on the island of Singapore, about 2½ miles from the heart of the city, is the most attractive feature of this combined Gibraltar and Liverpool of the Orient. It is only one degree north of the equator, less than 100 feet above sea level, and is watered with 100 to 140 inches of rain annually. There isn't a water pipe or piece of garden hose in all Singapore. The numerous palms and bamboos are among the most attractive features, while not the least interesting are the Para rubber trees, *Heva braziliensis*, from which have developed the great rubber plantations of the East Indies. One of these trees, planted in 1879, measures 10 feet 3 inches in circumference. Dr. Ridley, who recently resigned the position of Director, has kept the garden in remarkably good condition, considering the lack of funds and the small force at his disposal.

The Botanical Garden at Buitenzorg, founded in 1817, is justly regarded as the great botanical garden of the world. It is 5° 20′ south of the equator, 861 feet above the sea, covers 83 acres all planted, and with 219 rainy days a year has about 16 feet of rain. The garden is strictly tropical and one looks in vain for plants of temperate or even semitropical regions. Among hundreds of palms, the date palm and palmetto are conspicuously absent. The plants, all perennials and largely trees, are arranged by families, each species represented by two specimens, and each specimen labeled with a number and the technical name. The visitors' laboratories connected with this garden, where visiting botanists may carry on research work, is a feature for which the generous management of the gardens deserves the gratitude of the botanical world.

The Public Gardens at Hongkong are perched on terraces on the steep mountain side above the town, and are accessible to no conveyance except a Sedan chair. The 16 acres in the gardens contain plants of the tropics, semitropic and warmer temperate climates. The herbarium at this garden contains one of the best collections of south China plants in existence. One of the most attractive trees in the garden is *Araucaria rulea* from New Caledonia, about 6 m. high and almost perfect in form and color.

The small garden at Taihoku, the Japanese capital of Taiwan (Formosa), is only a few years old. The Japanese effect produced by ponds, mounds, rustic bridges and dwarfed trees is quite different from anything seen elsewhere. Camphor and other trees of Taiwan are represented and plants are being introduced from other countries.

These botanical gardens are fulfilling a many sided mission, in attracting tourists, educating even the casual observer as to the identity of plants, indicating the sources of plant products, introducing and dis-

tributing plants of economic value, and affording research workers exceptional opportunities for study.

Fermentation of cellulose. K. F. KELLERMAN, I. G. MCBETH and F. M. SCALES. In the formation and maintenance of humus in agricultural soils the fermentation of cellulose is probably of fundamental importance yet our knowledge of this question is inadequate. Omeliansky's generally accepted conclusions that cellulose is destroyed only under anaërobic conditions and gives rise either to hydrogen or methane are erroneous.

Two species of cellulose-destroying and five species of contaminating bacteria were isolated from a culture of Omeliansky's hydrogen organism, and one cellulose-destroying and two contaminating forms from his methane culture; none of the three fermenting species showed any resemblance to Omeliansky's hydrogen or methane ferments. In addition to the species isolated from Omeliansky's cultures eleven other species have been isolated from various other sources; one isolated from manure belongs to the thermophile group.

Contrary to Omeliansky's observation that cellulose-destroying bacteria do not grow upon solid media, most of the species isolated were found to grow readily upon such media as beef agar, gelatin, starch, and potato. Some are facultatively anaërobic, but none are strictly anaërobic.

It is usually supposed that filamentous fungi are of little importance in agricultural soils; these investigations show them to be at least as important as bacteria in destroying cellulose. About seventy-five species of molds have been isolated representing a large number of genera; species of Penicillium, Aspergillus, and Fusarium are perhaps most numerous.

In the destruction of pure cellulose either by bacteria or molds in synthetic media the associative action of organisms which presumably have no cellulose-dissolving enzymes frequently stimulates the growth of the cellulose organism and increases its destructive power.

Some phases of microscopical detection of decomposition in food products. B. J. HOWARD.

W. W. STOCKBERGER, *Corresponding Secretary.*

THE GEOLOGICAL SOCIETY OF WASHINGTON

The 247th meeting was held in the Cosmos Club, November 8, 1911, President Brooks presiding. As an informal communication Mr. CHARLES A. DAVIS discussed the presence of locomotive cinders in salt marsh deposits near Boston as affording evidence of continuing subsidence during the last half century.

REGULAR PROGRAM

Is there a Permian Series?: LAURENCE LA FORGE. The question might be better put "Is there a Permian system, or a Permian series in the *Carboniferous* system?" Probably nowhere is the entire "Permian" found in conformable sequence with Demetian (Pennsylvanian) below and Triassic above. Where lower "Permian" conformably overlies Demetian it is with difficulty separated from it and is limited above by an unconformity and upper Permian is commonly absent; likewise where upper Permian is conformably succeeded by Triassic it is limited below by an unconformity and lower Permian is absent. Where lower and upper Permian are found together they are commonly separated by an interval of mountain-building with a consequent strong unconformity. Evidences of Permian glaciation have been discovered in all the continents, indicating a marked epeirogenic uplift, occurring generally thruout the world and accompanied in several continents by mountain-building, early in Permian time.

These facts seem to indicate that to form the Permian system or series there were combined formations and stages not properly belonging together, and the earlier and later of which are separated by a deformation of world-wide importance. This time of epeirogenic uplift, glaciation, and mountain-building would seem to be the best-defined and most reasonable point of separation of the Paleozoic and Mesozoic eras. Hence it is suggested that Permian be abandoned as a separate system or as a series in the Carboniferous, and that the lower part be included in the Demetian (Pennsylvanian), while the upper part forms a new series in the Triassic.

In the scheme of the International Geological Congress the Permian series is subdivided into the Autunian (or Artinskian), Lodevian, and Thuringian stages. In the United States the Dunkard group of the Ohio valley, the Chase and Wichita groups of the Great Plains, and the Cutler formation of Colorado are Autunian, which stage appears to be wanting in England, but is well developed in continental Europe. In the proposed new scheme it becomes the closing stage of the Demetian (Pennsylvanian) and remains Carboniferous. The Lodevian stage is sparingly developed in America, but the Sumner and Clear Fork groups of the Great Plains are correlated with it. It is well developed in Europe and farther east. In the western United States the Kiger, Salt Fork and Double Mountain groups, and the lower part of the Chugwater group, with perhaps other formations farther west, are Thuringian, which stage includes the typical Permian of Russia, the Zechstein of Germany, and the bulk of the English Permian. In the new scheme the Lodevian and Thuringian stages make up the initial series of the Triassic system, for which series the name Permian (or Permic) might well be retained.

This is virtually a return to the original classification, in which the middle and upper parts of the present Permian of Europe were combined with the present Triassic in the New Red Sandstone or Poikilitic system, while the lower part was considered Carboniferous. It is not proposed,

however, to revive the name Poikilitic, but simply to retain the name Triassic, extended downward to include the new, reduced, Permian series. It will be seen that the new scheme avoids the difficulty in various regions of distinguishing between Permian and Carboniferous, resulting in the hybrid name Permo-Carboniferous, since all such strata fall within the Carboniferous by virtue of the establishment of the base of the Permian at a higher horizon.

The bonanza of National, Nevada: WALDEMAR LINDGREN. This paper gave the preliminary results of a reconnaissance examination in the vicinity of the National mining camp, which is remarkable for the richness of the gold ore in its principal mine.

The northern end of the Santa Rosa Range, from the Oregon line for almost sixteen miles south to Canyon Creek, is made up of a succession of basalt flows, interbedded with tuffs. Some of these flows are scoriaceous, others massive; they are well exposed north of Eight-Mile Creek, where the whole series, over 2000 feet in thickness, dips east at gentle angles. They form part of the great volcanic area of the Columbia River lavas and extend far to the north, east and west of National. They were erupted in early Tertiary time, a time of intense volcanic activity all over the Cordilleran region.

In the earlier portion of this epoch of vulcanism the lavas in the National district were basaltic in character. At a later time rhyolites were poured out, and at the same time dikes and masses of rhyolite and obsidian, generally trending north and south, forced their way up thru the basalts and tuff beds, in places disturbing them greatly. Big blocks of basalt are sometimes imbedded in the rhyolite. A third and later intrusion was of a dark, fine-grained rock provisionally called an andesite. It is of importance because of the ore bodies that it contains. Still later volcanic activity produced successive basalt flows covering the rhyolites, and basalt dikes cutting those of rhyolite.

The formation of mineral veins followed the eruptions of rhyolite and andesite. Shortly after these eruptions fissures trending north and south were opened, mainly along the rhyolite dikes, sometimes also breaking into the basalt flows and the tuffs. The fissures are generally small, rarely over a few feet in width, and commonly much less. The fissure filling is mainly quartz, with drusy structure, and the characteristic combination of metals is antimony (stibnite), iron (pyrite or marcasite) gold and silver. Lead, copper and zinc are generally absent. Cinnabar has been observed at a few places. The veins thruout bear evidence of having been deposited by hot, ascending springs at a moderate depth below the surface. The majority of the veins so far described are clearly dependent upon the rhyolite eruptions; they sometimes carry considerable amounts of stibnite and the silver values usually prevail over those of gold. None of the veins of the type so far described has as yet yielded any considerable amount of shipping ore. The case of the National vein is somewhat different. It is mainly contained in an andesitic rock but it also cuts into basalt and rhyolite. Tho its ore yields some antimony (both as stibnite and ruby silver) the

quartz is distinctly different from that of other veins, being more massive and milky and less drusy, and there is in fact some reason to believe that its mineralization took place a little later than that of the veins following the rhyolite dikes.

This quartz vein, of very moderate thickness, contains along a well-defined shoot a most remarkably rich bonanza ore, consisting of coarse and hackly pale gold (possibly electrum) firmly imbedded in the white quartz. An interesting characteristic is that within the bonanza shoot rich and barren quartz may intermingle capriciously. The gold is not a secondary deposit; in fact, there is scarcely any evidence at all of such secondary solution and redeposition of the gold by descending surface waters, while there is evidence that some of the silver has been leached by surface waters and redeposited as ruby silver. There is also some secondary marcasite. The shoot has been followed for a distance along the dip of the vein of about 800 feet, the lowest level being opened by a cross cut from Charleston gulch. The production of this extraordinary bonanza since its discovery two years ago is said to have been no less than $2,000,000 up to last fall, mainly in gold. Most of the ore had a tenor of from $10 to $40 per pound. Some high silver values were found at the surface, but the apex of the gold shoot was not encountered until about 60 feet below the surface. No placers have been found in Charleston gulch or in Eight-Mile Creek, in spite of the fact that a great deal of rock has been removed by erosion. Hence it is probable that this gold shoot never reached the surface, and that no other of a similar nature existed within the rock volume carried away by erosion. The almost inevitable conclusion is that such shoots must be scarce below the present surface.

The exploration of the Noatak River, Alaska: P. S. SMITH.

The 248th meeting was held in the Cosmos Club, November 22, 1911, Vice-President Stanton in the chair. As an informal communication Mr. ROBERT ANDERSON gave an account of the formation of a new island two miles off the south coast of Trinidad by an outburst of gas from the Tertiary oil and gas-bearing strata of the submerged coastal shelf. The island is of mud, sand and boulders, is about 10 acres in extent and has a height of 10 or 15 feet above the sea. The later stage of the eruption of this mass was accompanied by a great flame, due to the ignition of the gas. This ignition probably resulted from friction between sulphur-bearing rocks which were shot out.

REGULAR PROGRAM

The Carlyle oil field of Illinois: E. W. SHAW. The Carlyle oil field is about forty miles east of St. Louis and was discovered in the spring of 1911. It lies about fifteen miles west of the Sandoval oil field which was discovered in 1909. The excitement at Carlyle was intense and fabulous prices were paid for leases on farms which later proved to be outside the

productive territory. In structure the rocks have the form of an arch about 50 feet high on a general eastward dip of about 20 feet to the mile. The oil is found in a soft, porous sandstone in the uppermost part of the Mississippian series, a little over 1000 feet below the surface. There are many layers of barren sandstone above and below, which, like the producing sand, are arched; but they differ from it in that they extend out beyond the borders of the field, whereas the producing sand pinches out on three sides of the pool. On the fourth side this sand is full of salt water. All of the wells yield gas, oil, and water, the initial production of oil ranging up to 2000 barrels a day. There are now over a hundred wells and the total production is about 6000 barrels a day. The oil has a gravity of 33 to 37 degrees Baumé. Most of the wells are shot with about forty quarts of nitro-glycerine.

An old erosion surface in eastern Utah, its age and value in time determinations: JOSEPH B. UMPLEBY. During reconnaissance studies in 1910 and 1911 an old erosion surface was recognized in eastern Idaho. It was seen to be older than one group of mineral deposits but to truncate the other. Thus its age if definitely established would place limits on two great periods of mineralization. The aim of this paper is (1) to show that an old erosion surface extends over much of Idaho and into adjacent regions; (2) to outline the evidence for the conclusion that it is of Eocene age; (3) to suggest that the elevation of the highlands which were later planed down was accompanied by great granitic intrusions, and (4) to point out the relations of the Eocene surface to the ore deposits.

1. A correlation is suggested between the erosion surface in eastern Idaho and the plateau-like surfaces that have been recognized in west central Idaho and the Clearwater Mountains by Lindgren, in the Coeur d'Alene range of Idaho and the Cabinet and Purcell ranges of western Montana by Calkins, in the Galton and possibly also the Livingston and Lewis ranges farther east by Willis, in the Interior Plateau of British Columbia, where Dawson describes an Eocene peneplain, and in the Republic district of Washington by the speaker.

2. Early Miocene sediments, laid down in great erosion valleys developed after the last important elevation of the old erosion surface, indicate its pre-Oligocene age, allowing Oligocene time for the development of the valleys. On the other hand the surface cuts all the older formations, including the Idaho granite which is post-Triassic. Furthermore, the Eocene sediments of the Northwest surround the plateau region and were evidently derived from it. They could not have come from this region after its last elevation for two reasons: (a) It is doubtful if there has been sufficient dissection of the plateau to supply the volume of sediments represented, and (b) all the more important later valleys of the region drain westward. The conclusion, therefore, is that the Eocene sediments were derived from the plateau region during that cycle of erosion which resulted in gentle topographic forms, and hence that the old erosion surface is of Eocene age.

3. The plateau region as before defined is characterized by numerous granitic batholiths which are of about the same age and comprise pos-

sibly one-third its area. It is safe to assume that the intrusion of this material either caused or accompanied a profound elevation of the surface; yet the area of granitic intrusions shows no significant relation to surrounding sedimentary deposits until the Eocene. It is suggested, therefore, that the granitic intrusions initiated or accompanied the initiation of the cycle of erosion which resulted in the gentle topographic forms of Eocene age.

4. The Eocene erosion surface truncates the earlier mineral deposits. On the other hand these are younger than the granite which encloses some of them. They are therefore assigned to the late Cretaceous or early Eocene. The later veins are enclosed in or associated with eruptive rocks which occupy valleys developed after the elevation of the Eocene surface. Allowing the Oligocene period for the development of these valleys and evaluating the amount of erosion that took place between the extravasation of the lavas and the beginning of the Pleistocene, it is concluded that the younger veins are Miocene or early Pliocene.

Mines and prospects of southwestern Oregon: J. S. DILLER. This paper presented the preliminary results of a study not yet completed, which will later be embodied in a report by the Geological Survey. A general geological map of northwest California and southwest Oregon illustrated the distribution of the larger groups of formations and called attention to the fact that the Sierra Nevada and Klamath Mountains are composed in large measure of the same formations and that these formations are closely allied also to those of the Blue Mountains of eastern Oregon. All these mountains are important mining regions.

The rocks of the Klamath Mountains have been subjected to vigorous compressive stresses in two directions approximately at right angles to each other. One set of stresses folding the rocks along axes running northwest and southeast, and prevailing in the southwest portion of the Klamath Mountains, connects them with the Sierra Nevada; the other set of stresses folding the rocks along axes running southwest and northeast, and prevailing in the northeast portion of the mountains, connecting them with the Blue Mountains of Oregon.

As a result of the divergent stresses there has been widespread crushing on diverse lines among the rocks of the Klamath Mountains. Consequently the later igneous intrusions with their mineralizing ore-bearing solutions from within the earth found many scattered lines of egress towards the surface, and the ore deposits, though abundant, represent in general a low instead of a high degree of concentration.

On a map of southwest Oregon was shown the location of the principal gold and copper mines from the California line thru the Grant's Pass region to Bohemia, and on a special sketch map was outlined the geology and mines in the vicinity of Galice and Kerby. Attention was called to the fact that the Galice slates contain fossils characteristic of the Mother Lode district in California.

ROBERT ANDERSON, *Secretary.*